

NAME C

MD PAEDIATRICS

IMPACT OF MODE OF TRANSPORT OVER NEONATAL MORBIDITY AND MORTALITY

INTRODUCTION

NEONATAL MORTALITY

Around the world the neonatal mortality rate (NMR) has been estimated to be four million per year (4,000,000/Year). Ninety Percent of this is contributed by the developing countries like South East Asia and Africa.³ In developing countries the NMR is 6.5 times greater than that of the developed countries³.

In India, the neonatal death is about 1.3 million per year in 2000⁴. In 2007 it is reduced to 1 million per year⁶. In 1996, the NMR was 47/1000 live births². In 2004 NMR was 39/1000 live births.⁶ The NMR in rural areas is almost double when compared to the NMR in urban areas³². Even in urban areas the NMR is higher than it is in urban slums.¹⁸

In Tamilnadu the NMR in rural areas is 29/ 1000 live births and in urban areas it is 17/1000 live births in the year 2000.² The major reason for high NMR in rural areas is poor care during birth⁶. In 2007 the institutional deliveries were increased to 90.7%⁴. Even though the institutional deliveries were increased the NMR is around 39/ 1000 live births.

Among the NMR in rural areas cause of death due to birth asphyxia was 26% and low birth weight was 28%⁴. The low birth weight

babies delivered at level 1 or home have higher mortality and morbidity than babies delivered at tertiary level centre⁶. Here the transport plays a major role over neonatal morbidity and mortality.¹⁹

NEONATAL TRANSPORT

HISTORY

Neonatal transport began in the year 1900 with the mobile incubator by Dr. Joseph Delee of Chicago USA . In 1934 the first dedicated neonatal transport vehicle was invented by Dr. Martin Couney. The first air transport was done by Colorado Air National Guard in the year 1958. The first rotor wing transport done by " Peoria journal star " helicopter to ST. Francis hospital in the year 1967.¹

TRANSPORT IN DEVELOPED COUNTRIES

In the west, they have two modes of transport, one is air transport and the other one is ground transport. The type of vehicles are ground ambulance, rotar wing aircraft and free wing air craft¹. Air transport is faster and less time consuming. But it requires separate transport from referral place to the airport and it is costlier and weather condition also affects the transport. The advantages of ground ambulances are that it is economical and least affected by weather condition and the disadvantage is that it is time consuming. ¹ when

transport time exceed more than two hours , air transport is usually appropriate.¹⁰

NEONATAL TRANSPORT IN INDIA

In developing countries where there are financial and funding constraints for air ambulances, road transport is probably the only alternative ¹². In the past in India, we have problems because of scarce and inaccessible neonatal care, ill equipped facilities for neonatal care, lack of organized transport, poor road links, and poor communication⁸. Safe neonatal transport has been a distant dream in most of the developing countries¹¹. Of the neonatal transport there is a 60% increase in mortality due to unstable transport.⁶

In most of the developing countries there are no dedicated and specialized neonatal transport services which transport babies from far flung areas¹³, in India referral transport system is virtually inadequate.ⁱ⁴ With less experienced staff , the risk of adverse effects on such transport is greater than with well equipped and trained staff. ¹⁵ Some studies were said that the significant reduction in mortality when the fetus was transferred in-utero rather than after delivery^{24,29}.

INDICATORS OF STABLE NEONATAL TRANSPORT

The indicators of stable transport were on arrival are assessment of temperature , oxygen saturation , sugar and capillary refill time. ¹⁶ So the stable transport means stabilize the temperature ,oxygenation, circulation and sugar levels of the neonate before and during transport.⁸ On arrival hypoxia ,hypotension, hypoglycemia and hypothermia have been found to contribute increased mortality and these help to assess the effects of stabilization and transport. ¹⁷

STABLE NEONATAL TRANSPORT

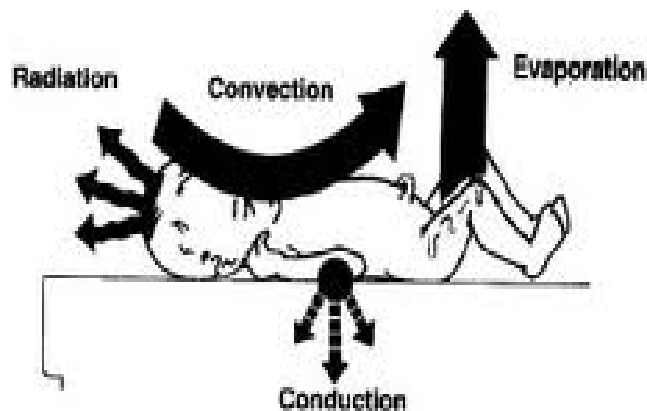
STABILIZATION OF TEMPERATURE¹⁰

Newborn prone to develop hypothermia because

- large surface area compared to body weight
- poor insulation for conservation of heat due to thin layer of subcutaneous fat
- non shivering thermogenesis which involves increased metabolism oxygen consumption and reduced amount of brown fat⁹

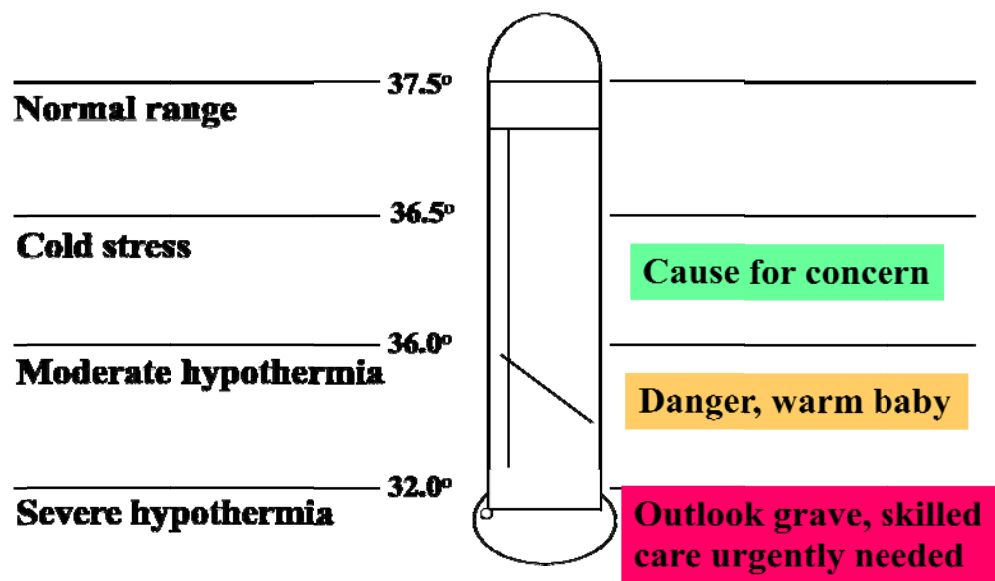
THERMOREGULATION¹⁰

Newborns lose heat by four mechanisms : radiation to cold walls and surroundings , evaporation if the baby is wet due to amniotic fluid at birth or urine later , convection by draught of air due to fan or through windows and conduction through contact with cold surface.¹⁰



GRADES OF HYPOTHERMIA⁹

The normal range of newborn's body temperature is 36.5 to 37.5⁰ C. If the baby's temperature is between 36.0⁰ c to 36.5⁰ c , the baby is in cold stress . The temperature between 36.0 to 32.0 C , it is defined as moderate hypothermia which needs rapid re warming . The temperature below 32.0 C is defined as severe hypothermia and it has poor prognosis . Body temperature above 37.5 C is defined as hyperthermia.⁹



CLINICAL MENIFESTATIONS OF HYPOTHERMIA³

- Baby maybe restless or uncomfortable
- May look sluggish or inactive
- Poor suckling and weak cry

- Severe hypothermia – lethargic and shallow irregular respiration with bradycardia
- Face and extremities bright in color

WARM CHAIN⁹

Warm chain should be maintained for maintenance of newborn's temperature. The delivery room temperature should be more than 25 C , the equipment and sheet used for resuscitation should be warm , either under the warmer or with heat source . Baby should be thoroughly dried immediately after birth, taking care not to ignore head, axilla and groin. Baby should be adequately clothed and kept with the mother. Keeping the baby between the mother's breast in skin to skin contact helps in keeping the baby warm. If the baby is able to suck early breast feeding should be initiated within half an hour of birth. In case baby not able to suck but not a sick baby, expressed breast milk should be given with spoon or paladay. All these measures should continue during transport.

METHODS OF CHECKING TEMPERATURE¹⁰

TACTILE ASESSEMENT

- ❖ With dorsum of hands , touch the baby's abdomen and to assess the temperature
- ❖ If the trunk and sole are warm the baby is normothermic

- ❖ If the trunk is warm and soles are cold to touch, the baby is in cold stress
- ❖ If the both trunk and soles are cold the baby is hypothermic
- ❖ If the baby's trunk is hot and the soles are less warm or cold, the baby is febrile.

RECORDING AXILLARY TEMPERATURE

1. Use a low reading thermometer to record axillary temperature.
Low reading thermometer reads up to 25 C.
2. Clean the thermometer with cotton swabs
3. Shake the thermometer to get the mercury level below 32 C
4. Dry the axilla and keep the bulb of thermometer at the tip of dried axilla for 3 to 5 minutes
5. Hold the baby's arm close to the body to keep thermometer in place
6. Remove the thermometer and read the thermometer at eye level
record the temperature
7. The reading after 3 to 5 minutes is the actual axillary temperature of the baby and should be documented as such

MANAGEMENT OF MILD HYPOTHERMIA⁹

- ❖ Remove the cold clothes from the baby
- ❖ Keep the room warm and draught free
- ❖ Provide kangaroo mother care and skin to skin to contact under supervision
- ❖ Monitor temperature and capillary refill time during re-warming

MANAGEMENT OF MODERATE TO SEVERE HYPOTHERMIA¹⁰

- ❖ Rapid re-warming over few hours is preferred to slow re-warming
- ❖ Re- move cold cloths from contact with the baby
- ❖ Set desired temperature on the radiant warmer or incubator and allow the baby to warm
- ❖ Keep the baby naked until complete re-warming
- ❖ Monitor temperature, oxygen saturation, capillary refill time and blood sugar

HYPERTHERMIA¹⁰

Hyperthermia occurs when the newborn's body temperature rises above 37.5 C

MANAGEMENT OF HYPERTHERMIA⁹

- ❖ Move the baby in cooler environment
- ❖ Loose the cloths
- ❖ Replace the fluid loss either by breast feeds or by intravenous fluids

PREVENT HYPERTHERMIA⁹

- Do not overdress the baby
- Do not expose incubators to direct sunshine in hospitals
- Monitor the baby's body temperature frequently

PRE TRANSPORT TEMPERATURE STABILIZATION⁹

Clothing of neonates is important and should be wrapped in dry sheets. The simplest and safest way of transport of babies are by putting the baby in KMC (kangaroo mother care) . For unstable babies transport incubator is preferred. If transport incubator is not available, thermocol box with holes for air circulation preferred. When the baby is being transported in thermocol box, check that the water filled bags are warm and not excessively hot and are not in direct contact with the baby.



Thermocol Transport



KMC During Transport

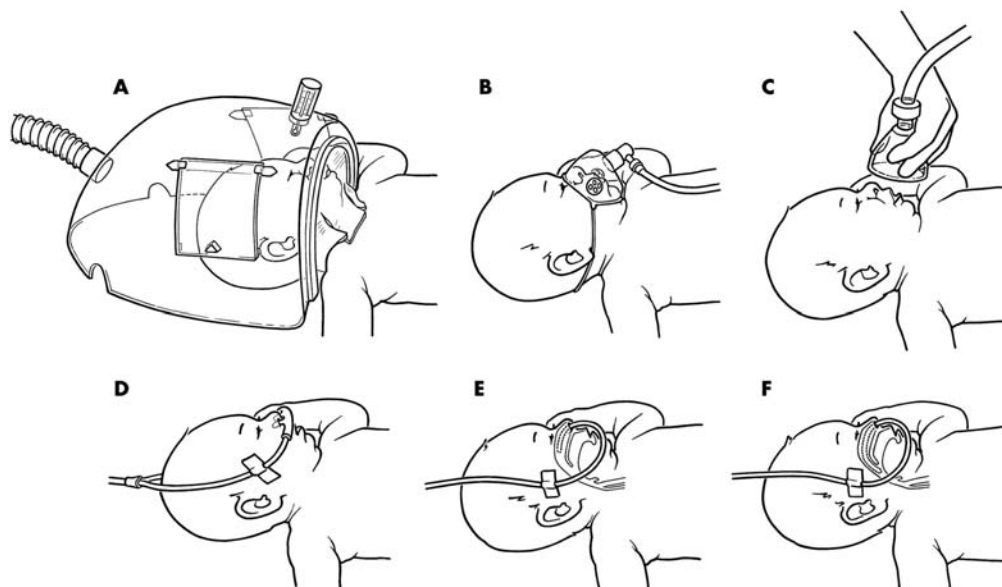
STABILIZATION OF AIRWAY & BREATHING⁹

Stabilize the airway by keeping the head of sick baby in slightly extended neck position , helps the baby to breath better . Clear the mouth and nose of any secretions, either by wiping with clear cloth or with the help of mucus aspirator.

Oxygen has to be provided either by oxygen cannula or bag and mask ventilation. In severely asphyxiated or sick babies should be transported with endotracheal tube ventilation by accompanying a health care provider. During transport if the baby went for apnea, stabilize the airway with slightly extended neck position, clear the airway and provide tactile stimulation. In prolonged apnea provide bag & mask ventilation. So health care provider accompanying the baby should be aware of apnea and should have skill to provide bag and mask ventilation.

OXYGEN DELIVERY⁹

Before and during transport correct hypothermia and hypoglycemia. Before transport oxygen flow must be checked by flow over dorsum of hand. Oxygen can be delivered to the baby with a cupped hand, oxygen cannula, oxygen mask or oxygen hood. Monitor clinically for respiratory rate, chest retractions and disappearance of central cyanosis or monitor with pulse oximeter if it is available.



STABILIZATION OF CIRCULATION¹⁰

Ensuring adequate perfusion prior to transport and on arrival at referral hospital is critical to survival of sick newborn babies. Inadequate perfusion will result in hypoxia and acidosis³⁰. If perfusion is not restored in time, it will result in decreased oxygen delivery and cell death¹⁰. Early recognition of poor perfusion is essential to initiate appropriate treatment⁹.

CLINICAL RECOGNITION³⁰

The simplest indicator of perfusion is a prolonged capillary refill time. Normally it should be less than 3 seconds. Other indicators are mottling of skin pallor, tachycardia (HR > 180 bpm), decreased urine output, peripheral pulse and heart sounds.

PRETRANSPORT STABILIZATION⁹

Immediate step when neonate is having poor perfusion is to ensure that the breathing is adequate. If not provide bag and mask ventilation by using ambu bag. Secure the airway by intubation is preferable as it is important to have a secure airway during transport. If spontaneous efforts are good, provide supplemental oxygen either by free flow, oxyhood or if the newborn is incubated by positive pressure ventilation. After stabilizing the airway, intravenous access is established and must be secured and give isotonic fluid bolus to maintain circulation

STABILIZATION OF BLOOD SUGAR¹⁰

Glucose is a vital source of nutrient energy and is required continuously by the fetus¹⁰. Hypoglycemia can cause long term neurological sequelae⁴. The infant is born with a blood glucose concentration of 60 to 70 percent of the maternal level and it falls during the first 24 hours⁴. The lowest value is seen at the age of 3 hours⁴. This is followed by a transient rise in blood glucose level during 24 hours and again dangerously low levels may be encountered at the age of 3 to 4 days before stability is achieved⁴.

Risk babies¹⁰

- Intrauterine growth retardation
- Prematurity wt<2kg

- Birth asphyxia
- Hypothermia
- Septicemia

PRETRANSPORT STABILIZATION⁹

- Babies those who are under risk factors should have blood sugar examination before transport.
- Stable babies who needs further management should be fed with expressed breast milk by spoon or paladay.

Unstable babies should have iv cannula and give intravenous dextrose before transport.

THE OTHER FACTORS AFFECTING DURING TRANSPORT¹

1. Noise
2. Vibration

VIBRATION¹

It is an Unique problem during transport, Vibration affects transport team by producing motion sickness, which produces drowsiness, inability to concentrate and disinclination to communicate with others. Vibration affects monitors, which shows artifacts.

NOISE¹

The acceptable sound level in neonatal intensive care unit is 60-70 decibels. But the levels exceed during transport to 90-110 decibels. The effect of high sound levels to newborn is unknown. But repeated episodes of high sound levels to the transport personnel causes hearing loss. It also affects the auscultatory findings during transport.

POOR LIGHTING

Patient care compartment should have illumination to 400 lux. High intensity light sources should be available for procedures.

REFERRAL NOTE⁹

Write a precise note for the providers at the referral facility providing details of the baby's condition, reasons for referral and treatment given to the baby.

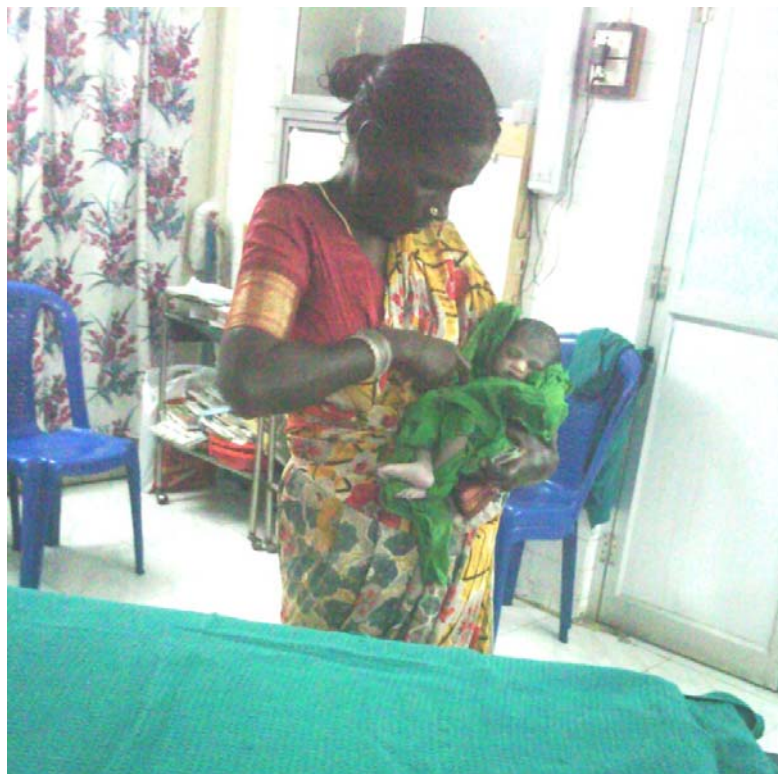
GENERAL PRINCIPALS OF STABLE TRANSPORT¹

1. Prepare the transport vehicle ,
2. Assess and stabilize the baby before transport,
3. Provide supplemental
4. Lighting ,regulated heating and adequate oxygen source in transport vehicle,
5. Monitor all possible physiological factors
6. Anticipate deterioration during transport

**POOR STABILIZATION DURING TRANSPORT RECEIVED
IN CHMCH-NICU**



BAD BABY RECEIVED WITHOUT AIRWAY SUPPORT



108 AMBULANCE³¹

Emergency medical and research institute (EMRI) was introduced in India by the year 2005 to reduce the mortality during transport by unskilled persons. It was organized by a collaborative partnership between a private and public forum to attend three important emergencies such as fire, police and medical. In Tamilnadu the MOU was signed on May 6, 2008 and it has assigned for 385 ambulances to activate EMRI.



REVIEW OF LITERATURE

Gupta P et al, had done a study at Indraprasta Apollo hospital, New Delhi, to assess the clinical status of out born (retrieved v/s referred) at the time of admission and correlated the mode of transport to immediate morbidity and mortality. It was a retrospective comparative analysis of 500 out born newborns admitted to neonatal intensive care unit over the period of 3 years. Of the 500 reported cases, 157 were referred by Apollo transport team and the remaining 343 were self transported from referral centers. The babies transported by Apollo transport team had 10.1% of hypothermia, 13.3% of hypoglycemia, 1.2% of cyanosis, 7.6% of CRT > 3 seconds and 15.9% of acidosis. Self transported babies had 65.5% of hypothermia, 32% of hypoglycemia, 56% of cyanosis, 80.9% of CRT > 3 seconds and 27.6% of acidosis. This shows that both the immediate and long term outcome varies with the mode of transport and with the initial stabilization of the newborn.

Poddutoor Preetham Kumar et al, had done a retrospective descriptive study regarding neonatal transport at rainbow's children hospital, Hyderabad. This study compares prolonged inter hospital long distance transports on road undertaken by a qualified transport team vs those done by the same team from shorter distances at time. The study period was 48 months and the study assessed the biochemical characters, adverse effects during transport and 24 hrs survival. This study concluded that long distance neonatal transport on road is feasible and

with a qualified team results can be comparable to those transported from shorter distances.

J.e.Harding et al , had done a study about adverse effects neonatal transport between level 3 centres at university of Auckland. This study compared the outcome of 40 newborns transported to other level 3 centre with matched 80 inborn controls. Among the transported groups 32% grew less than 3rd centile, 40% had periventricular leukomalacia. Conclusion of this study was transport adversely affects the outcome of newborn.

M. hohlegschwandtner et al, had done a study at university of Vienna. This study compared the morbidity and mortality between the antenatal and post natal transported groups. This study showed that postnatal groups had higher survival rate(94%) but significantly higher morbidity(88.4%). This study concluded that antenatal transport guaranteed a significantly better outcome than postnatal groups.

Calwin G lowe et al, carried out a retrospective study by comparing iNo initiated at the referral hospital and iNo initiated at the referring hospital. Conclusion of this study was iNo therapy during transport had significantly better outcome.

JUSTIFICATION OF THE STUDY

This study was chosen by our department because of increased morbidity and mortality of extramural babies. So this study wants to assess the babies referred from referral centers were received in NICU with poor stabilization prior to transport and during transport.

So this study wants to document

- The mode of transport
- Vital status on arrival
- Personnel accompany
- Outcome of transported babies.

Along with that this study also plans to improve the outcome extramural babies by improving neonatal transport.

AIMS AND OBJECTIVES

OBJECTIVES:

1. To analyze the morbidity and mortality of neonates between the babies transported ambulances with other mode of transport
2. To analyze the morbidity and mortality of neonates transported in-utero with ex-utero from referral centres.

METHODOLOGY

DESIGN OF STUDY: prospective study

PERIOD OF STUDY: December 2009 to may 2010

STUDY PLACE: Chengalpattu medical college and hospital,

Neonatal intensive care unit.

SELECTION OF STUDY POPULATION:

INCLUTION CRITERIA:

- All the newborns born extramurally
- Extramural babies died during transport
- Born intramural and readmitted
- Babies born to antenatal transported mothers from level 1 centre

EXCLUTION CRITERIA:

- Babies delivered intramural and not referred in antenatal period

METHODS

All the newborns received in our level 2 neonatal intensive care unit were assessed for IMNCI signs and the general condition was assessed by primary assessment. In sick newborns with unstable airway were managed with positive pressure ventilation by bag and mask or endotracheal intubation ventilation.

All the babies were received in intensive care unit were measured the temperature by placing temperature probe over body. Temperature was also measured by digital thermometer. Before the temperature was measured the digital thermometer was pressed to make the value at 000. Then thermometer was placed with the mercury tip under the axilla. Thermometer was kept there for few minutes until the beep sound came. Then the measured temperature was recorded. Babies were managed according to the temperature by warming up.

For all babies capillary refill time was measured. The skin over the mid sternum is pressed with bail of the thumb for 5 seconds so that it blanches. The thumb is then lifted and time taken for refilling of the capillaries and return to the original colour is noted .Normal CRT is less than 3 seconds. It means that it takes 3 seconds or less for the blanched skin to regain the pink color. If it takes longer than 3 seconds indicates the perfusion is poor. Poor perfusion was managed with normal saline boluses as 10ml/kg along with that inotrope support was initiated.

For all babies capillary blood sugar was measured. To measure capillary blood sugar posterolateral aspect of the heel was wiped with spirit. Then heel prick was made by lancets. A drop of blood allowed to stain the dextrostrix and capillary blood sugar was measured. Both hyper and hypoglycemia were managed according to the sugar level. If the blood sugar was < 45 mgrms 2ml/kg of 10% dextrose was given. Meanwhile blood sample was also sent for laboratory analysis.

Pulse oximetry was used to measure the oxygen saturation. Babies were supported with oxygen when the saturation falls below 85%. Airway was supported according to the tolerance of the baby with nasal cannula , CPAP ventilation or ventilator.

Consent was obtained by a study physician who read the entire consent form to the parent, as this happens to be predominantly an illiterate population. If parents had questions, it was clarified by explanation.

All extramural babies mode of transport and reason for transport was documented. Whether the babies were accompanied by trained person or not also were noted. Events and management during transport also were documented. The distance of transport and duration of transport for all extramural babies were noted.

STATISTICAL ANALYSIS

The data was collected by using pretested proforma by the investigator. Data collected were subjected to statistical analysis using version 7 of spss. Ordinal data and nominal Variables are presented as number (percentage). The immediate neonatal morbidity (hypothermia, Hypoglycemia, shock and cyanosis) and mortality was compared between the groups of babies transported by ambulances and other mode of transport by using student's T test for quantitative data ,kk 9 and chi square test for qualitative data. The data were analysed using contingency table analysis with Fisher's exact test or Pearson chi square test x 2 with Cochran's test of linear trend for correction as indicated. A value of $P < 0.05$ was considered significant.

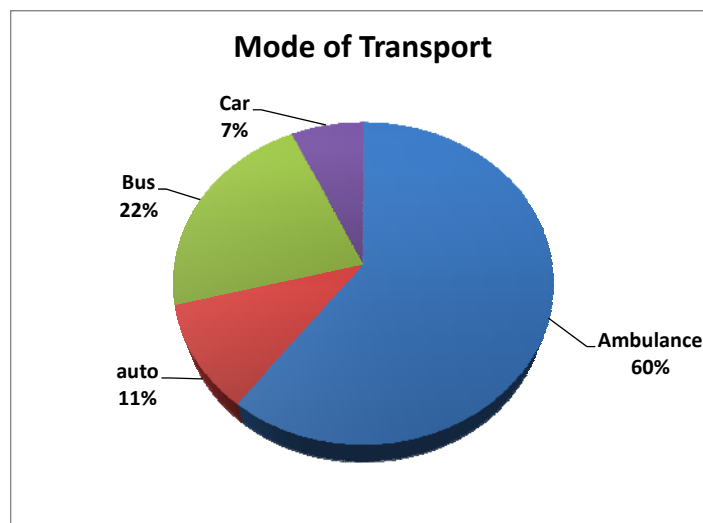
RESULTS

MODE OF TRANSPORT

Among 490 babies of this study during 6 months period , 60% of babies were transported by ambulances than other mode of transport(22% bus,11% auto,7% car). Analysis shows significant difference between ambulances and other mode of transport. It showed that ambulances were the primary mode of transport.

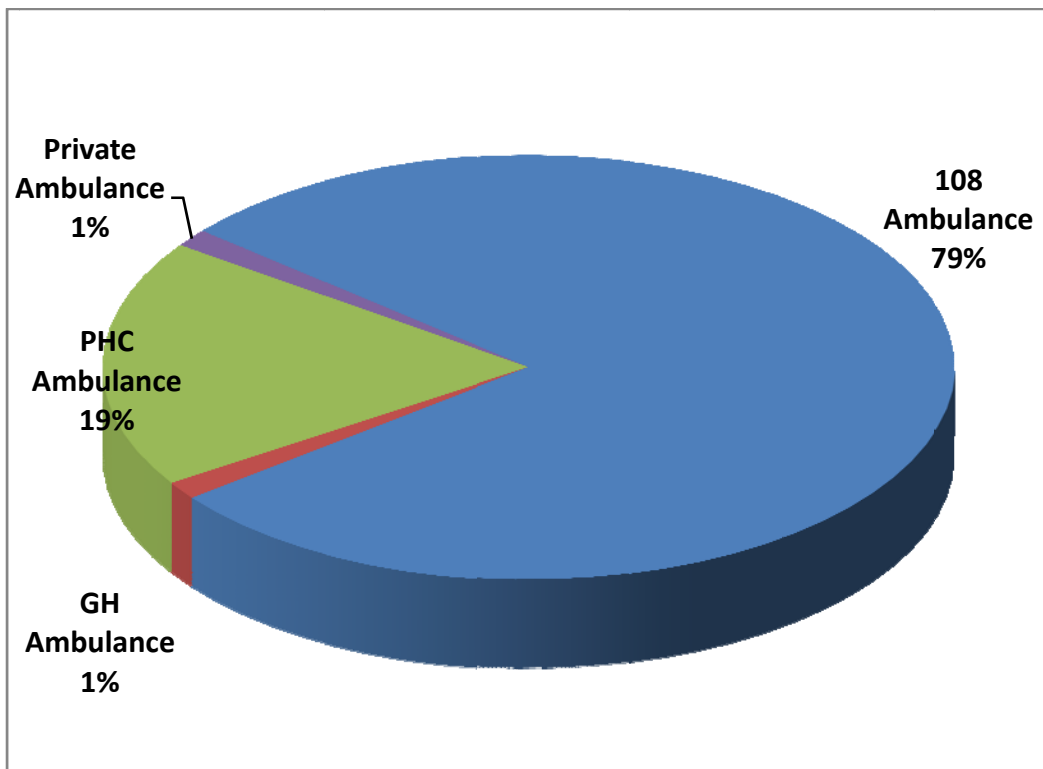
Mode of Transport

1	Ambulance	296	60.4
2	auto	52	10.6
3	Bus	108	22.0
4	Car	34	6.9
5	Total	490	100



There is significant ($p= 0.000$) difference between the two modes of transport. Among the 60% of babies transported by the ambulances, 79% were transported by 108 ambulances

Ambulance		Percentage
108 Ambulance	232	79
GH Ambulance	4	1
PHC Ambulance	56	19
Private Ambulance	4	1
Total	296	100



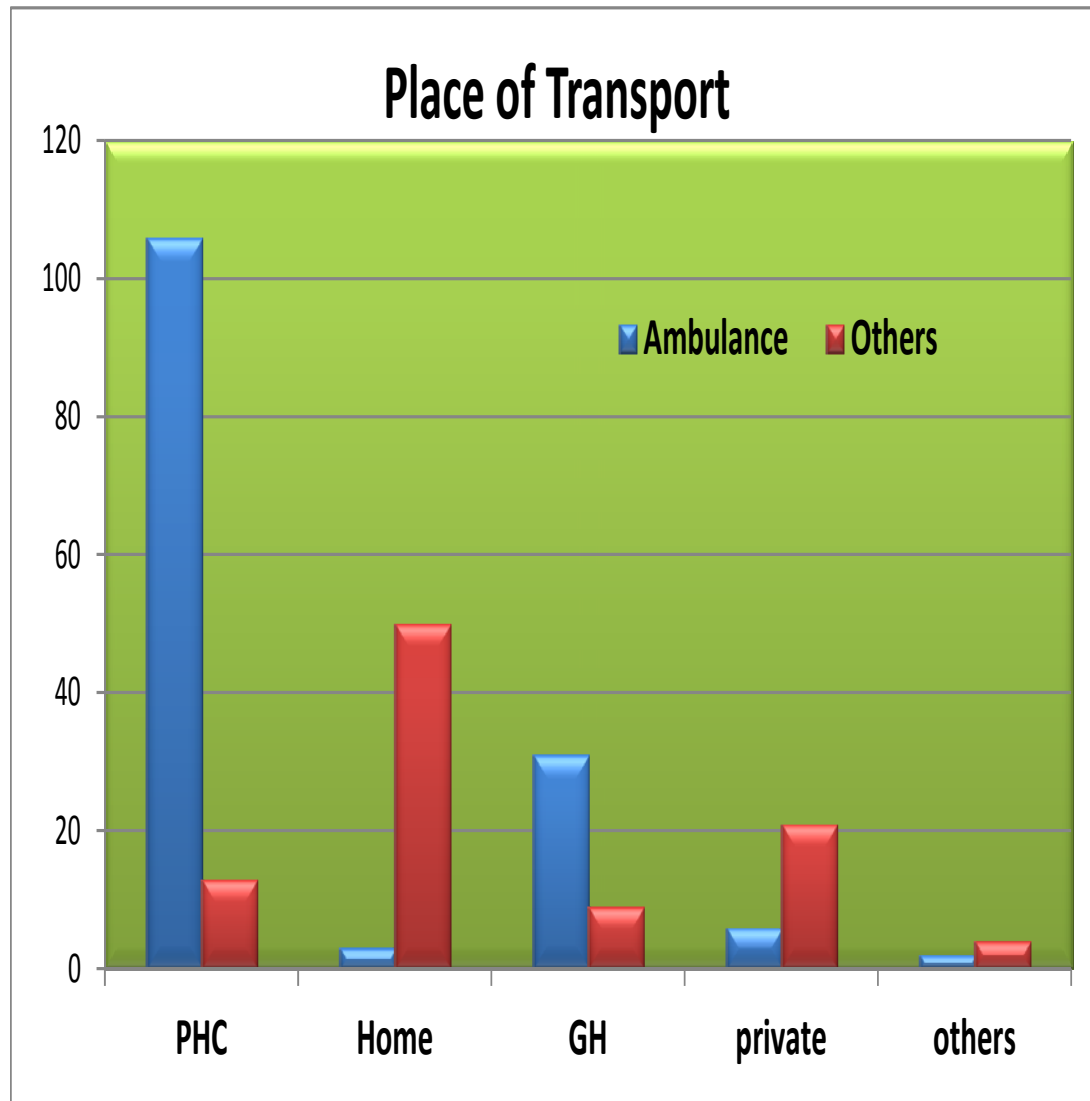
PLACE OF TRANSPORT

The primary health centre was the primary referral centre according to this study. This study showed ($p = 0.0001$) significance for the place of referral. Among the extramural babies 48% from PHCs and 16% from GH were referred to chengalpattu medical college.

Comparison between Mode of transport Vs place of referral.

	Transport From					Total
	PHC	Home	GH	private	others	
Mode Transport						
Ambulance	212	6	62	12	4	296
Others	26	100	18	42	8	194
Total	238	106	8	54	12	490

There is a significance difference between the Ambulance and other mode of transport. $p=.000 (<0.05)$



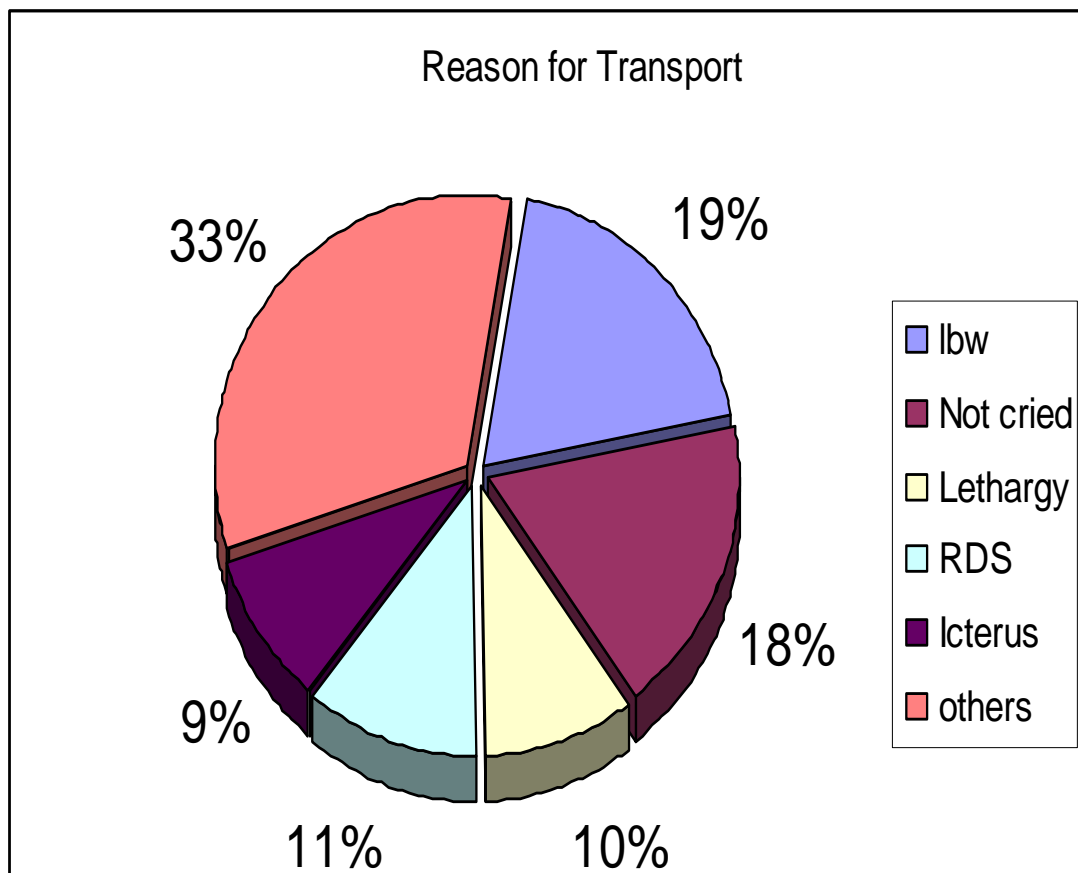
REASON FOR TRANSPORT

The reasons for transport were documented from the referral note and verbal questionnaire. Among the reasons for transport not cried at birth (birth asphyxia), low birth weight were placed as the primary cases for transport. In the community it is difficult to ascertain the status of birth asphyxia. Among the deliveries conducted by referral center, apgar score was documented only less than 1% of cases. Hence not cried at birth was considered as birth asphyxia.

Reason for Transport

1	Not cried	88	18.0
2	Lethargy	48	9.8
3	RDS	54	11.0
4	Icterus	46	9.4
5	Others	160	32.7
	Total	490	100.0

Among the reason for transport not cried at birth(18%) and low birth weight(19%)were the major causes for referral.

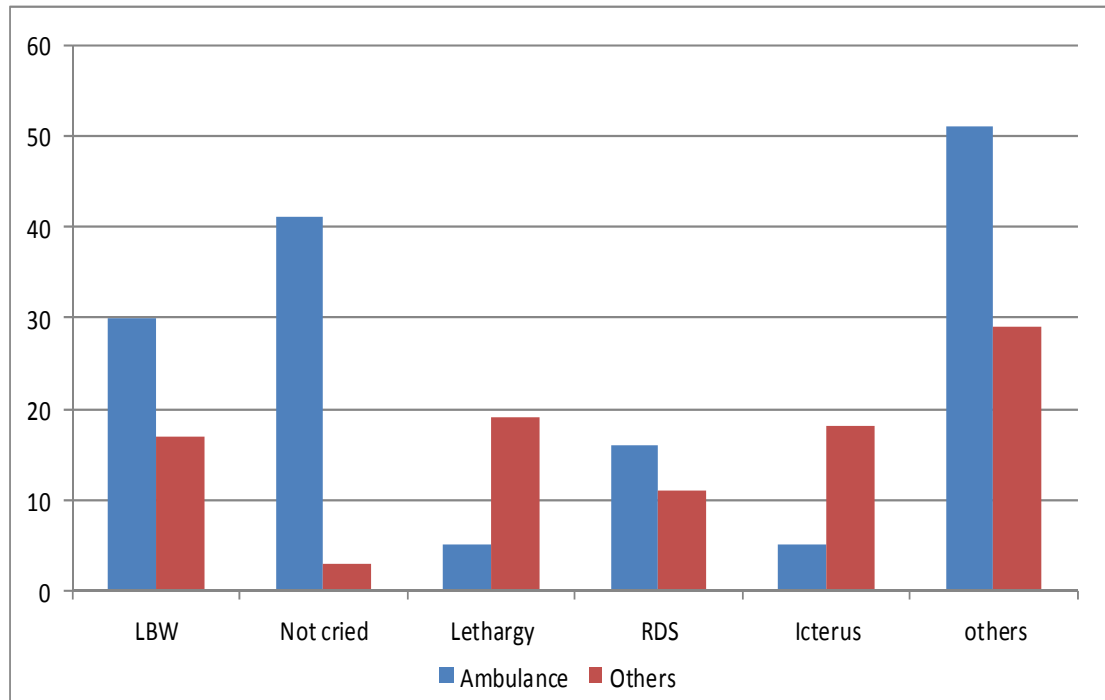


Comparison of mode transport Vs recasons for Transport

This analysis showed that low birth weight (20%) and birth asphyxia (27%)babies were transported by ambulances than other mode of transport.

		Reason Transport						
		LBW	Not cried	Lethargy	RDS	Icterus	others	Total
Mode transport	Ambulance	60	82	10	32	10	102	296
	Others	34	6	38	22	36	58	194
Total		94	88	48	54	46	160	490

There is a significance difference between the ambulance and other mode of transport. **p=.000 (<0.05)**



PHYSIOLOGICAL STATUS AT ARRIVAL

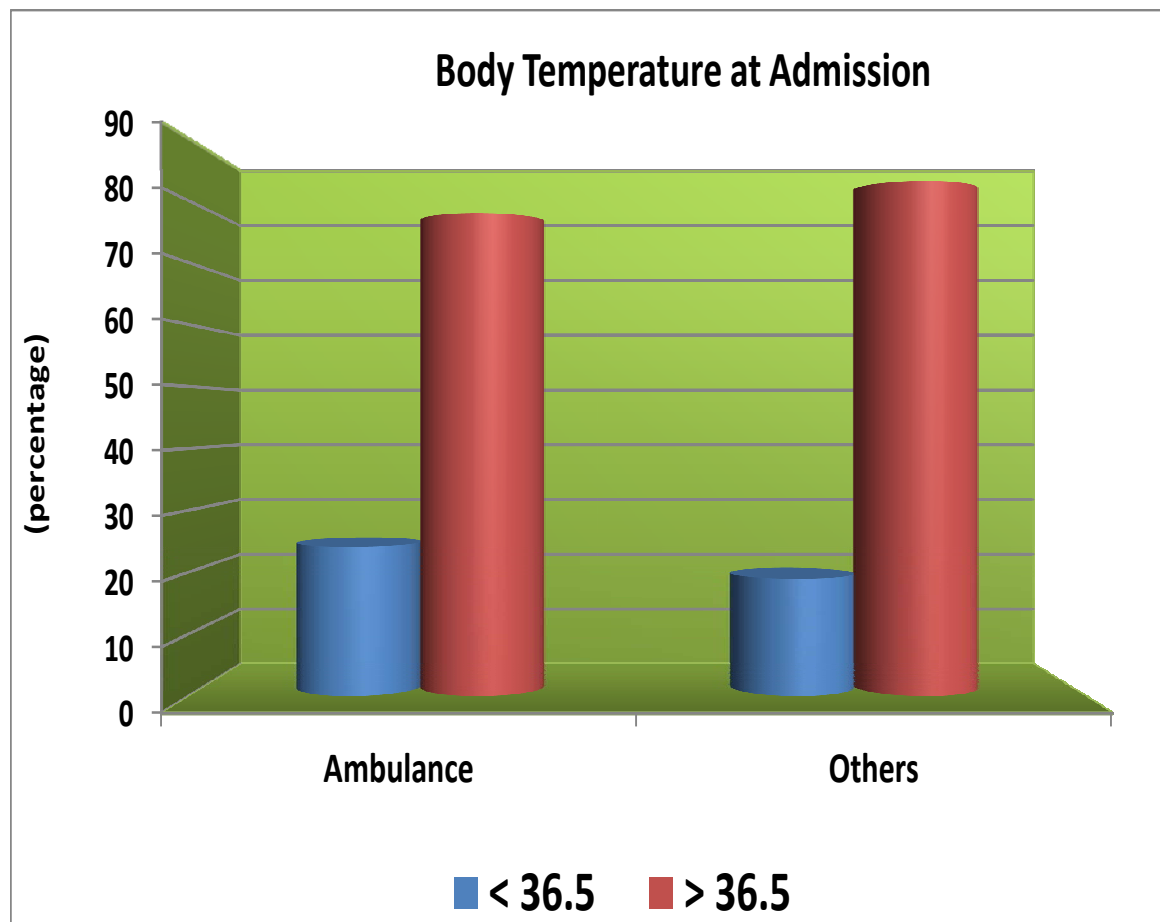
In physiological scoring there was no significant difference between the ambulance and other mode of transport. The clinical signs of hypothermia, hypoglycemia, CRT and spo2 were studied as substitute for SNAP score to assess the morbidity at the time of arrival, because of unavailability ABG in Chengalpattu medical college and hospital.

Temperature assessment showed that 22% were transported by ambulances had hypothermia as compared to 16% in other mode of transport. The p value = 0.277 showed no significant difference between the two groups.

Comparison of Mode of transport Vs Body temperature at admission

		Body Temperature at Admission		
		< 36.5	≥ 36.5	Total
Mode Transport	Ambulance	70	226	296
	Others	36	158	194
	Total	106	384	490

P value **0.322(>0.05)** there is no significant difference.



CAPILLARY REFILL TIME, SPO2 AND CAPILLARY BLOOD SUGAR

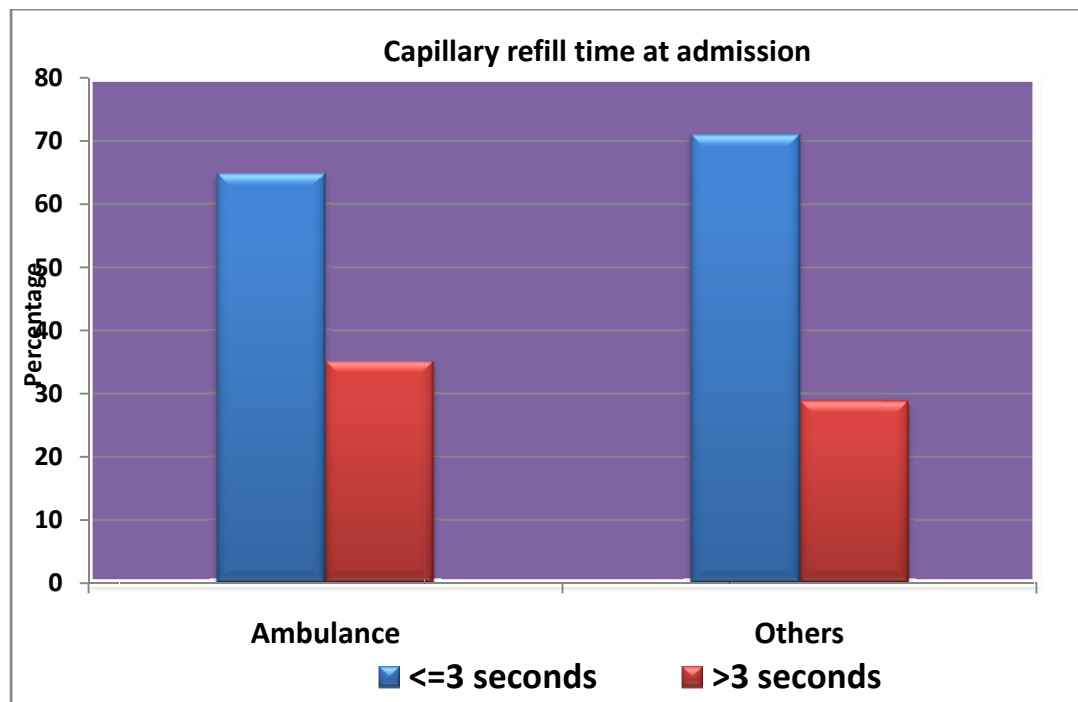
Measurement of other scores like capillary refill time, spo2 and capillary blood sugar level also shows no significant difference between the two groups .

The ($p = 0.254$) value showed that there was no significant difference between the babies transported by ambulances and other mode of transport in spo₂. The p value for capillary blood sugar ($p = 0.567$). The p value for capillary refill time ($P = 0.306$).

Babies were transported by ambulances 35% had prolonged CRT, 21% had hypoglycemia and 0.08% had cyanosis. In other mode of transport 28% had prolonged CRT, 18% had hypoglycemia and 0.04% had cyanosis.

Comparison of Mode Transport Vs Capillary refill time at admission (seconds)

		Capillary refill time at admission (seconds)		
		<=3 seconds	>=3 seconds	Total
Mode Transport	Ambulance	192	104	296
	Others	138	56	112
	Total	330	160	490

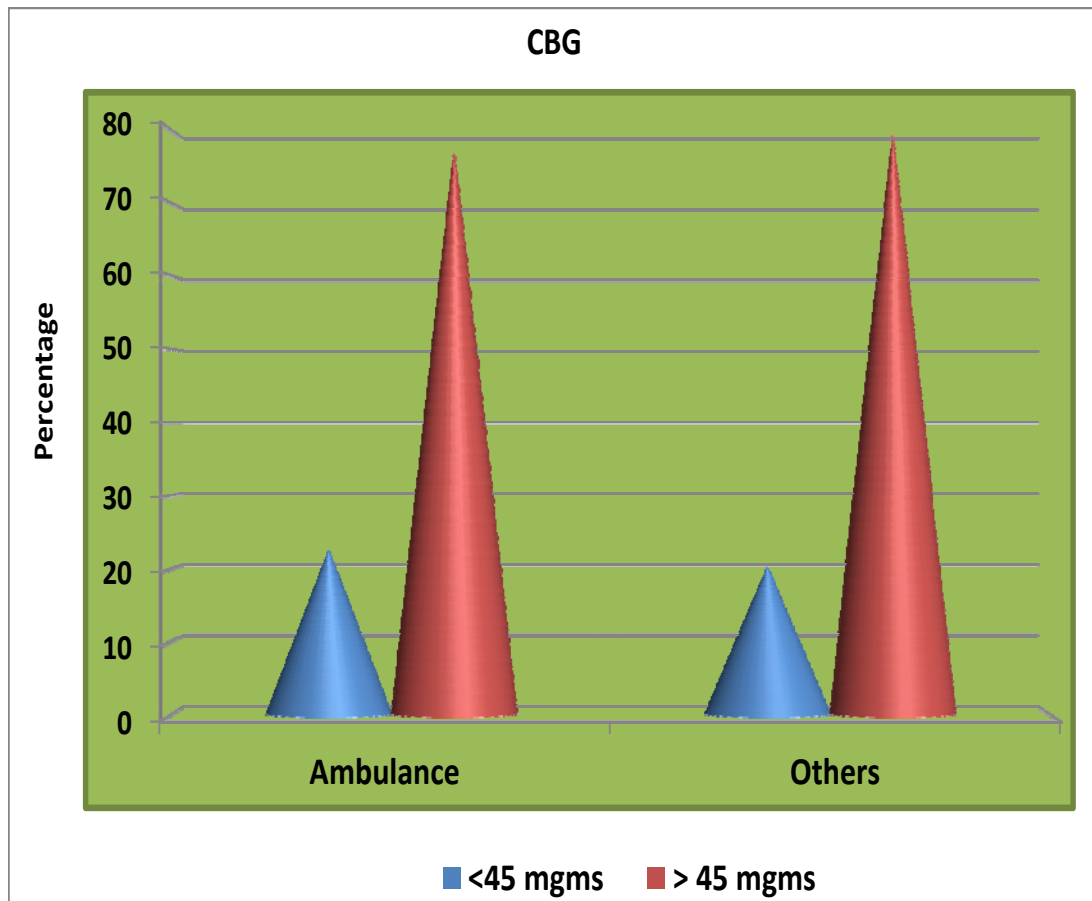


P=.306(>0.05) no significant difference between the two groups

Comparison of Mode Transport Vs CBG

		CBG		Total
		<45 mgms	> 45 mgms	
Mode Transport	Ambulance	68	234	302
	Others	38	150	188
	Total	106	384	490

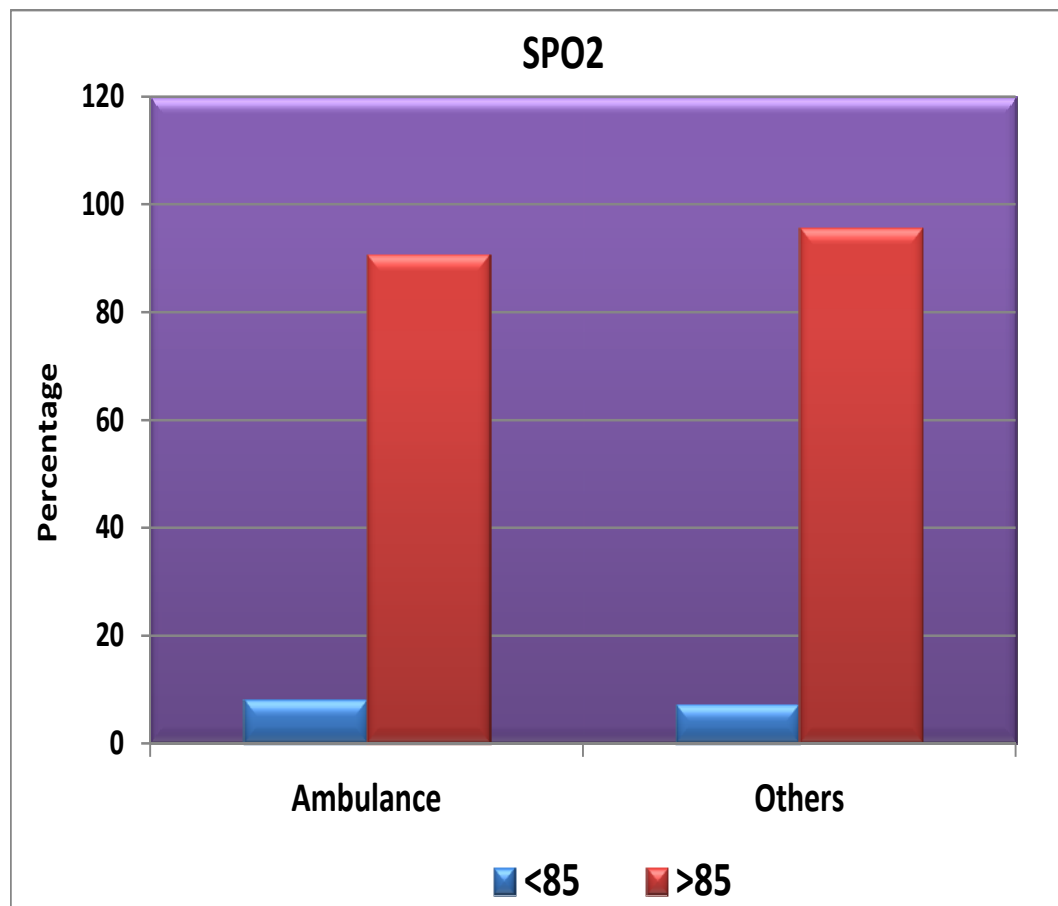
P value **0.567** (**>0.05**) there is no significant difference.



Comparison between mode of transport and spo2

Mode of Transport				Total
Spo2		Ambulance	Others	
	<85	28	9	37
	≥85	272	181	448
Total		300	190	490

P value **0.254(>0.05)** there is no significant difference.



Comparison of Mode Transport Vs Gestation at Birth

		Gestation at Birth				Total
			Not known	Pre-term (<37 week)	Term (37-42 week)	
Mode Transport	Ambulance	18	0	56	214	296
	Others	6	2	38	148	194
	Total	24	2	102	362	490

P value **0.417** (**>0.05**) there is no significant difference.

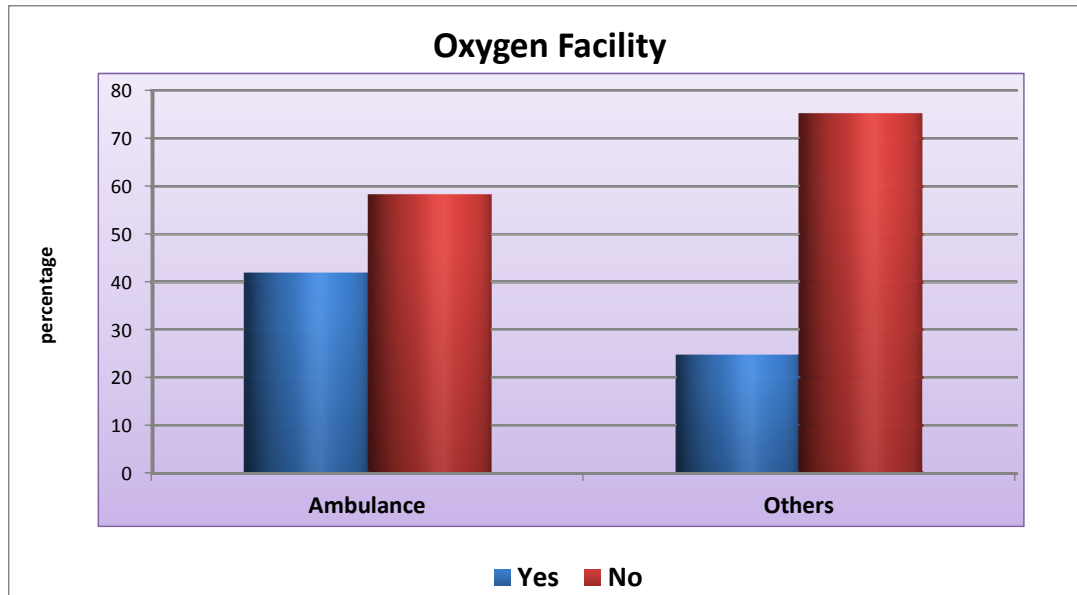
OXYGEN FACILITY

The babies were transported with oxygen support was 60% among the 296 babies in ambulance transport. Among the other mode of transport only 15% of babies were supported with oxygen. P value (0.0001) showed that there was a significant difference between the two groups. The babies transported by ambulances had higher percentage of oxygen support.

Comparison of Mode Transport Vs oxygen facility

		Oxygen Facility		Total
		Yes	no	
Mode Transport	Ambulance	124	172	296
	Others	48	146	194
Total		172	318	490

p = **0.0001(<0.05)** there is a significant difference in the oxygen facility among ambulance and other mode of transport.



ACCOMPANY BY HEALTH PERSON

There is a significant (0.0001) difference among ambulance and other mode of transport in relevant to the accompanied personnel. The babies were transported with ambulances 98% were accompanied by medical person compared to only 7% in other modes of transport. Among the accompanying person the ambulance transport the 108 ambulance were accompanied by emergency technician.

Comparison of Mode Transport Vs Accompanied by

		Accompanied by		Total
		Medical Personnel	Family members	
Mode Transport	Ambulance	280	16	296
	Others	14	180	194

		Accompanied by		Total
		Medical Personnel	Family members	
Mode Transport	Ambulance	280	16	296
	Others	14	180	194
Total		294	196	490

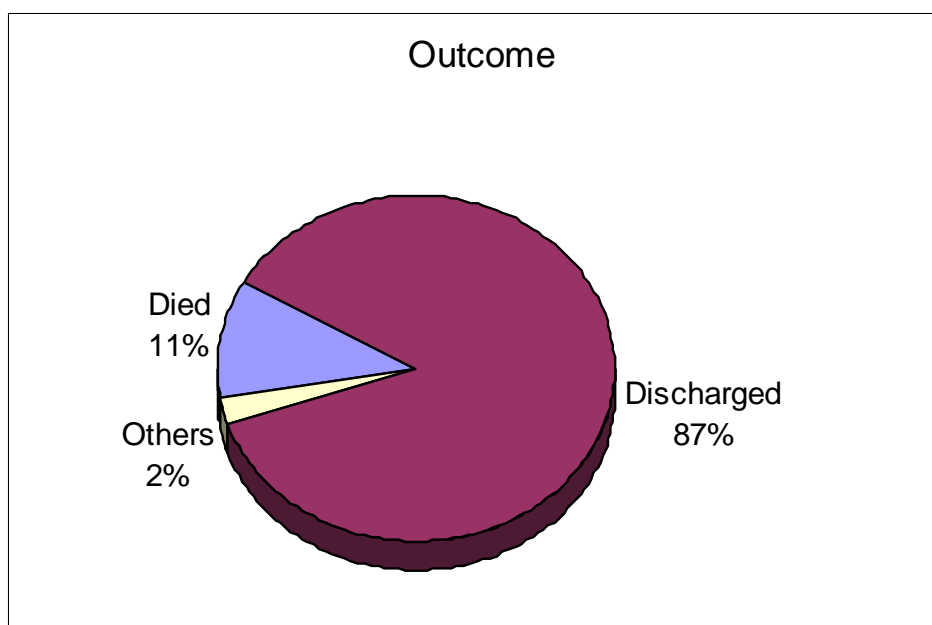
P value **0.0001(<0.05)** there is a significant difference among ambulance and other mode of transport in relevant to the accompanied personnel

OUTCOME

Outcome of study population were studied as percentage of death, discharge and left against advice or referred. According to this study, among the extramural babies 87% were discharged, 11% were dead and 2% were referred and left against advice in six month study period. The p value showed that ($p = 0.507$) there was no significant difference between the babies transported by ambulances and other mode of transport.

Outcome

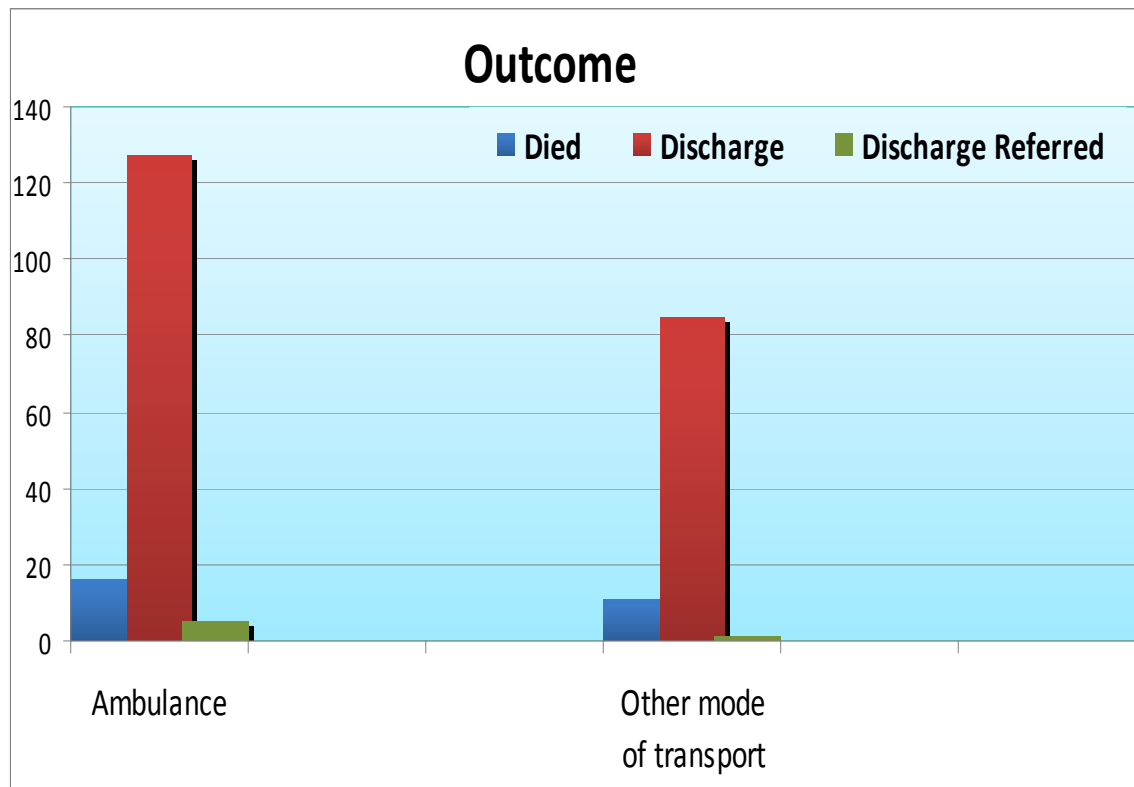
1	Died	54	11.0
2	Discharged	424	86.5
3	Others	12	2.4
	Total	490	100.0



Comparison of mode of Transport and outcome in Extramural

	Died	Discharge	Referred &AMA
Ambulance	32	254	20
Other	22	170	2
Total	54	424	44

P value 0.507(>0.05) there is no significant difference.



COMARISON BETWEEN ANTENATAL vs POSTNATAL TRANSPORTED GROUPS

Here the babies born to mothers who were referred to chengalpattu medical college in antenatal period from Primary health centres and Government hospitals were compared with all babies referred in post natal period. The comparative analysis between the antenatal referral and postnatal referral showed that postnatal

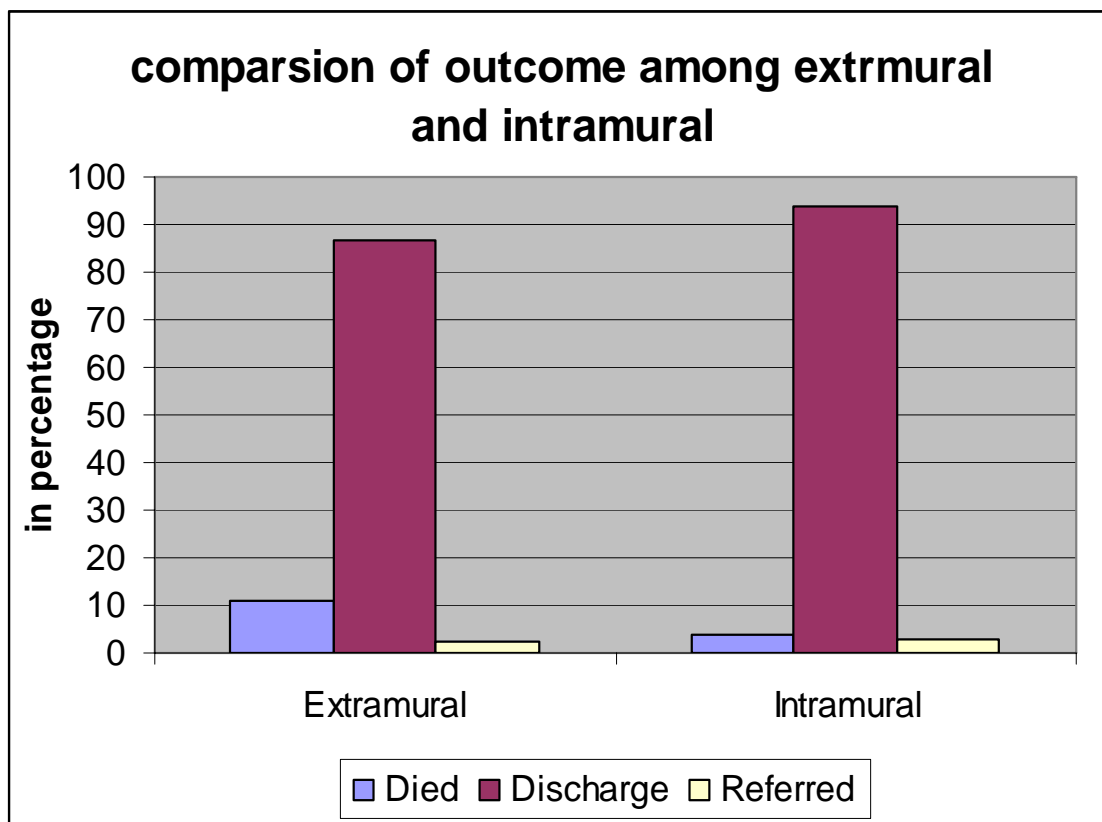
referral showed 11% mortality compared to antenatal transport, it is only 3%.

There is a significant ($p < 0.0001$) difference between these two groups.

**Comparison of outcome between antenatal transported and
Post natal transported babies**

	Died	Discharged	Referred
Extramural	27	424	12
Intramural	45	2324	70
Total	72	424	12

Since the P value ($P < 0.0001$), there is a significant difference between the outcome among antenatal transport & postnatal transported babies. Here 11 % of postnatal transported babies were died whereas in antenatal transported cases only 3.6% of babies were died. Extramural has three times more number of deaths compare to antenatal transported babies.



CONCLUSION

This prospective observational study over a six months period (December 2009 to may 2010) conducted at chengalpattu medical college, neonatal intensive care unit concluded that the primary mode of transport for extramural babies were ambulances. Commonly the reasons for transport were birth asphyxia and low birth weight babies. The common referral center was primary health center. Among the ambulance transport the accompanying persons were not adequately trained with neonatal transport. So the immediate morbidity and mortality between the babies transported by ambulances and other mode of transport showed no significant difference. Among the transport between antenatal transported and postnatal transported babies were concluded that antenatal referral had better outcome than postnatal referral.

RECOMMENDATIONS

ANTENATAL TRANSPORT

As that recommended in previous study transport of antenatal mothers at right time will significantly reduce the neonatal mortality. So the referral centers should have intensive monitoring during delivery.

POST NATAL TRANSPORT

WHO NEEDS REFERRAL

The success of transportation of sick neonate depends on earlier identification, stabilization, referral and care during transport. The deferral center should know who needs transport. Transport requires for babies those who have not cried at birth, low birth weight, deep icterus, lethargy, convulsions, bleeding, and abdominal distention.

PREPERATION BEFORE TRANSPORT

Careful assessment of the baby, should be a genuine indication, stabilize the temperature, airway, breathing, circulation and blood sugar, write a referral note, encourage mother to accompany and arrangement of health provider to accompany during transport.

DURING TRANSPORT:

As per other Indian studies, the good neonatal transport team will reduce the neonatal morbidity and mortality significantly. In our study those accompanying the babies during transport were not adequately trained in neonatal transport. The available ambulances did not have infrastructure to transport like cradle and warmer. So the ambulances and transport team should be improved in neonatal transport.

DELAY IN REFERRAL

- Delay in recognition of severity of illness
- Delay in transport of the neonate
- Delay in delivery of appropriate care increase neonatal mortality.

So babies should be referred at right time.

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South East Asia regional

Neonatal –Perinatal Data Base

World Health Organization (South East Asia region)

Centre code:	Hospital record number:
Readmission	Sex: male/ambiguous/female
Born in this hospital: Yes/No	Age: completed days :
Date of admission:	hours :
Name of the baby :	Place of delivery: PHC/HC/
Date of birth:	Home/private/others
Weight at birth:	Delivery conducted by: doctor/
Gestational age: preterm/term/post-term	Nurse/midwife/DAI/ANM

ADMISSION DATA:

Birth weight (gms)

TRANSPORT DETAILS:

Reason for transport:	Transported with;
Transported from:	1) Oxygen
PHC/HSC/HOME/PRIVATE/GH/OTHERS	2) Iv fluids
Mode of transport: 108ambulance /	
ambulance PHC;	3) Bag&mask ventilation
Car/auto/bus/ others	4) ET ventilation .
	5) Nil
Accompanied by:	Transport duration :
Doctor/Nurse/VHN/Emer.Tech/Others	Arrival time :

Resuscitation details : Oxygen yes/ no

Bag & mask ; yes/no

Chest compression : yes/no

Intubation for meconium : yes / no

Intubation otherwise : yes /no

Adrenaline ; yes/no

Volume expanders : yes /no

Not available

SYMPTOMS & SIGNS:

History/difficulty in feeding:

Moves only when stimulated:

Temp ≥ 38 degree C: Yes/No

Temp < 35.5 degree C: Yes/No

Respiratory rate > 60 /min: Yes/No

Grunting: Yes/No

Severe chest indrawing: Yes/No

History of convulsion: Yes /No

Signs of dehydration: Yes/No

AT ADMISSION :

Temperature :

C R T : CBG :

BP : SPO2 :

Need of oxygen in 2 hours: yes / no

Seizure at admission: yes /no

Need of vasopressors : yes / no

Treatment prior to current admission:

MORBIDITY

Birth asphyxia :

RESPIRATORY DISTRESS

TTN :

Pneumonia: Yes/No

Meconium aspiration: Yes/No

Hyaline membrane disease

Pneumothorax: Yes/No

CNS DISORDERS

HIE : yes / no

IVH : yes /no

Intra cranial bleed : yes /no

Seizures : yes /no

Others :

MAJOR MALFORMATIONS:

Cardiac Malformation: Yes/No

Hydrocephalus: Yes/No

Neural Tube Defect: Yes/No

Cleftlip/Palate: Yes/No

Gastrointestinal Malformations : Yes/No

Genitourinary Malformations: Yes/No

Down's syndrome: Yes/No

Others: Yes/No

NEONATAL INFECTIONS:

SUPERFICIAL

Pyoderma: Yes/No

Umbilical Sepsis: Yes/No

Conjunctivitis: Yes/No

Thrush: Yes/No

SYSTEMIC INFECTIONS

Septicemia/Pneumonia/Meningitis: Yes/No

Tetanus Neonatarum: Yes/No

Others:

MISC.MORBIDITY:

Hyperbilirubinemia: Yes/No

Rh iso immunisation: yes / no

Hypothermia: Yes/No

Hypoglycemia: Yes/no

Apneic spell:

Anaemia/Polycythemia: Yes/no

NEC: Yes/No

PDA: Yes/No

Vitamin K Deficiency Bleeding: Yes/No

Neonatal Cholestasis: Yes/No

Major Birth trauma: Yes/no

(Fracture/peripheral nerve injury/CNS Trauma)

CLD:Yes/No

TREATMENT:

I/V Fluids:Yes/No

Antibiotics:Yes/No

Oxygen:Yes/No

CPAP:Yes/No

IMV:Yes/No

Surfactant:Yes/No

Blood/Plasma Transfusion:Yes/No

Phototherapy:Yes/No

Exchange Transfusion:Yes/No

Any Other Surgery:

BREAST FEEDING:

Initiated within 1 hr of Birth:Yes/No

At Discharge: Exclusive Breast feeding/Full Breast Feeding/Partial
Breast feeding

No Breast Feeding

OUTCOME:

Discharged/Died/Left Against Advice/Referred

CAUSES OF DEATH:

Perinatal asphyxia:Yes/No

Birth Trauma: Yes/No

Extreme Prematurity

(<28 wks or<1000gm):Yes/No

Malformations:Yes/No

Tetanus: Yes/No

Pneumonia/septicemia/meningitis: Yes/No

Hyaline Membrane Disease: Yes/No

Intra Ventricular Hghe: Yes/No

Others:

Neonatal Death:

Date of Death:

Time of Death:

South East Asia regional

Neonatal –Perinatal Data Base

World Health Organization (South East Asia region)

Centre code:	Hospital record number:
Readmission	Sex: male/ambiguous/female
Born in this hospital: Yes/No	Age: completed days :
Date of admission:	hours :
Name of the baby :	Place of delivery: PHC/HC/
Date of birth:	Home/private/others
Weight at birth:	Delivery conducted by: doctor/
Gestational age: preterm/term/post-term	Nurse/midwife/DAI/ANM

ADMISSION DATA:

Birth weight (gms)

TRANSPORT DETAILS:

Reason for transport:	Transported with;
Transported from:	1) Oxygen
PHC/HSC/HOME/PRIVATE/GH/OTHERS	2) Iv fluids
Mode of transport: 108ambulance /ambulance PHC;	3) Bag&mask ventilation
Car/auto/bus/ others	4)ET ventilation .
	5) Nil
Accompanied by:	Transport duration :
Doctor/Nurse/VHN/Emer.Tech/Others	Arrival time :

Resuscitation details : Oxygen yes/ no

Bag & mask ; yes/no

Chest compression : yes/no

Intubation for meconium : yes / no

Intubation otherwise : yes /no

Adrenaline ; yes/no

Volume expanders : yes /no

Not available

SYMPTOMS & SIGNS:

History/difficulty in feeding:

Moves only when stimulated:

Temp ≥ 38 degree C: Yes/No

Temp < 35.5 degree C: Yes/No

Respiratory rate > 60 /min: Yes/No

Grunting: Yes/No

Severe chest indrawing: Yes/No

History of convulsion: Yes /No

Signs of dehydration: Yes/No

AT ADMISSION :

Temperature :

C R T : CBG :

BP : SPO2 :

Need of oxygen in 2 hours: yes / no

Seizure at admission: yes /no

Need of vasopressors : yes / no

Treatment prior to current admission:

MORBIDITY

Birth asphyxia :

RESPIRATORY DISTRESS

TTN :

Pneumonia: Yes/No

Meconium aspiration: Yes/No

Hyaline membrane disease

Pneumothorax: Yes/No

CNS DISORDERS

HIE : yes / no

IVH : yes /no

Intra cranial bleed : yes /no

Seizures : yes /no

Others :

MAJOR MALFORMATIONS:

Cardiac Malformation:Yes/No

Hydrocephalus:Yes/No

Neural Tube Defect: Yes/No

Cleftlip/Palate: Yes/No

Gastrointestinal Malformations :Yes/No

Genitourinary Malformations:Yes/No

Down's syndrome:Yes/No

Others:Yes/No

NEONATAL INFECTIONS:**SUPERFICIAL**

Pyoderma:Yes/No

Umbilical Sepsis:Yes/No

Conjunctivitis:Yes/No

Thrush:Yes/No

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Septicemia/Pneumonia/Meningitis:Yes/No

Tetanus Neonatarum:Yes/No

Others:

MISC.MORBILITY:

Hyperbilirubinemia: Yes/No

Rh iso immunisation: yes / no

Hypothermia: Yes/No

Hypoglycemia: Yes/no

Apneic spell:

Anaemia/Polycythemia:Yes/no

NEC:Yes/No

PDA: Yes/No

Vitamin K Deficiency Bleeding:Yes/No

Neonatal Cholestasis:Yes/No

Major Birth trauma:Yes/no

(Fracture/peripheral nerve injury/CNS Trauma)

CLD:Yes/No

TREATMENT:

I/V Fluids:Yes/No

Antibiotics:Yes/No

Oxygen:Yes/No

CPAP:Yes/No

IMV:Yes/No

Surfactant:Yes/No

Blood/Plasma Transfusion:Yes/No

Phototherapy:Yes/No

Exchange Transfusion:Yes/No

Any Other Surgery:

BREAST FEEDING:

Initiated within 1 hr of Birth:Yes/No

At Discharge: Exclusive Breast feeding/Full Breast Feeding/Partial Breast feeding

No Breast Feeding

OUTCOME:

Discharged/Died/Left Against Advice/Referred

CAUSES OF DEATH:

Perinatal asphyxia:Yes/No

Birth Trauma: Yes/No

Extreme Prematurity

(<28 wks or<1000gm):Yes/No

Malformations:Yes/No

Tetanus:Yes/No

Pneumonia/septicemia/meningitis:Yes/No

Hyaline Membrane Disease:Yes/No

Intra Ventricular Hghe:Yes/No

Others:

Neonatal Death:

Date of Death:

Time of Death:

